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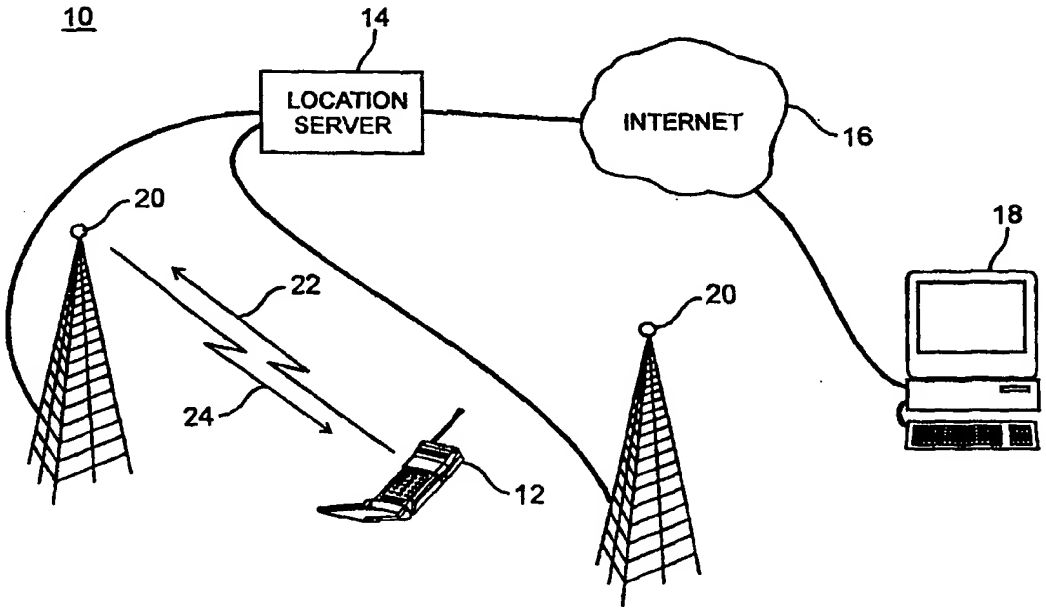
(54) Title: LOCATION SYSTEM AND METHOD



(57) Abstract

A location system (10) has a location server (14) connected to an internet (16) designed to receive a location query from a user. A wireless communication system (20) is connected to the location server (14) and is capable of transmitting the location query. A wireless transceiving device (12) is capable of receiving the location query (22) and sending a location response (24).

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LOCATION SYSTEM AND METHOD

Field of the Invention

The present invention relates generally to systems for determining location and more particularly to a location system having a server for processing location queries.

Background of the Invention

A number of location systems have been proposed for tracking loved ones and valuables. The advent of the Global Positioning System (GPS) allows extremely accurate determinations of where an object is anywhere in the world. Several systems have been proposed to combine a GPS receiver with cellular phone technology. A user attaches the cellular phone and GPS receiver to an object they want to located. Then the user queries the GPS receiver to send the location of the object over the cellular phone. None of these systems has shown significant commercial success. One reason appears to be that a user often has to register with and call a central dispatch to determine the location of the object. Another problem is that the GPS receiver provides the latitude and longitude of the object. This is generally not very helpful in a city, since it is difficult to correlate latitude and longitude to a street address.

Thus there exist a need for a location system that is easy to use.

Brief Description of the Drawings

FIG. 1 is a schematic view of a location system in accordance with one embodiment of the invention;

FIG. 2 is a schematic view of a location system in accordance with another embodiment of the invention;

FIG. 3 is a block diagram of a location server in accordance with one embodiment of the invention;

FIG. 4 is an exemplary view of an output from the location system in accordance with one embodiment of the invention;

FIG. 5 is a flow chart of the steps used in operating a location system in accordance with one embodiment of the invention; and

FIGs. 6 & 7 is a flow chart of the steps used in operating a location system in accordance with one embodiment of the invention.

Detailed Description of the Drawings

The present invention combines a location system, a wireless communication system and a location server. The location server allows a user to send a location query over the internet or over the phone. The location server then automatically has the object located and returns this information to a user in a useful format. For instance, the user might receive a street map showing where the object is located.

FIG. 1 is a schematic view of a location system 10 in accordance with one embodiment of the invention. A cellular phone 12 having a built in GPS receiver is carried by a person or object to be located. In another embodiment, the phone is a satellite phone (e.g., iridium) or a PCS phone or a two way pager or other wireless communication device. The GPS receiver can be any other location system, such as LORAN, or the location information being incorporated into systems like IRIDIUM. A user wanting to locate the device 12, logs into a location server 14 over the internet 16 using their computer 18. In one embodiment the location server includes a subsystem for authentication, accounting and authorization. The location server 14 in one embodiment has a world wide web URL (universal resource locator). The user is prompted by the location server web site to enter the appropriate information (location query). The location server 14 is connected to a wireless communication system 20, shown as a pair of antenna towers. The location server 14 sends the location query to the wireless communication system 20, which transmits 22 the location query to the wireless transceiving device 12. Note that when the wireless communication system is a cellular system, the location of the phone 12 is known by the system 20. Cellular systems poll phones that are on for information that allows the system to know where to route calls. Other

systems may broadcast the query generally. The wireless transceiving device 12 determines its location using an internal GPS receiver. A location response (e.g., latitude and longitude) 24 is passed to the location server 14. The location server 14 processes the location response to relate the latitude and longitude to a street map or street address. The processed information is then sent to the user's computer 18 over the internet 16.

FIG. 2 is a schematic view of a location system 30 in accordance with another embodiment of the invention. The location server 32 is connected to the internet 34 and to the public switched telephone network (PSTN) 36. Users can send a location query to the location server 32 using their computer 38 or by using a telephone 40. The location server 32 includes a map database 42. The location server 32 selects an appropriate map based on a position. A security system 44 is connected to the location server 32. The security system 44 performs three functions: authentication of the user; determines what information the user is authorized to access; and collects information for billing. In one embodiment the security system 44 queries a central database of the appropriate wireless communication system to determine if the user is authorized to access information about a particular device. Authorization to access information about the location or a particular device can be given at the time of signing up for service. In addition, authentication information can also be collected at the time of signing up for a service. In one embodiment, the billing information is used to bill the user through their wireless service. This allows the user to only pay for each location query as requested. This would eliminate the monthly service fees many other location systems use.

A plurality of wireless communication systems 46-50 are connected to the location server. The location server 32 determines the

appropriate wireless communication system and sends it a location request. The appropriate wireless communication system 48 then transmits an identify position message to a wireless transceiving device 52. The wireless transceiving device 52 includes a GPS receiver that determines the position. The device 52 then transmits the position to the wireless system 48, which passes the information on to the location server 32. The location server 32 then determines the appropriate map and sends a copy of the map with an identifier of the device's position over the internet 34 to the user's computer 38. In another embodiment, the location server interprets the closest street address of the position of the device and sends this information over the phone 40 to the user. Using the system described above eliminates the need to preregister, pay monthly subscription fees and takes advantage of the power of the internet to provide useful location information.

FIG. 3 is a block diagram of a location server 60 in accordance with one embodiment of the invention. The location server 60 includes a controller 62 connected to a security system 64. The security system 64 performs the functions of authentication, authorization and accounting. The users in one embodiment are assigned a password for authentication. In another embodiment authorization and accounting information is collected by the various wireless communication systems when a user subscribes to the system. In another embodiment the users preregister with the location server.

The controller 62 is connected to a map database 66. The controller 62 is able to determine the correct map based on a received position information. The controller then places a marker on the map where the device is located. In another embodiment the controller determines a closest street address based on the position information. The controller 62 is also connected to a voice recognition system 68 and

a speech synthesis system 70. The voice recognition system 68 allows the location server to receive oral location queries. The speech synthesis system 70 can be used to prompt a user to speak the required information and to "speak" the street address where the device is located. In one embodiment, the location server provides directions from a user's location to the device's location. In another embodiment, the location server has known landmarks and includes these in the instructions.

The controller 62 is also connected to a communication interface 72. The communication interface 72 provides access to the internet 74, the PSTN 76 and the wireless communication systems 78.

FIG. 4 is an exemplary view 80 of an output from the location system in accordance with one embodiment of the invention. The view 80 shows a map that would appear on a user's computer screen. A position marker 82 shows the position of the device on the street map. Using this information the user quickly knows the whereabouts of the device. The information is presented in a way that the user can quickly grasp and draw conclusions. For instance, the user may know that his daughter's friend lives on a cul de sac on Oak Circle.

Note that the system is also able to provide a voiced address or instructions to a user on the phone. This is allows the user to receive the location information in a manner in the most common format humans use.

FIG. 5 is a flow chart of the steps used in operating a location system in accordance with one embodiment of the invention. The process starts, step 100, by receiving a location query at a location server over the internet from a user at step 102. The location server then transmits a location request to a wireless communication network at step 104. The wireless communication network broadcasts an

identify position message over the wireless communication network at step 106. The device determines its position at step 108. The wireless transceiving device then transmits the position to the wireless communication network at step 110. At step 112, the position information is forwarded to the location server which ends the process at step 114.

FIGs. 6 & 7 is a flow chart of the steps used in operating a location system in accordance with one embodiment of the invention. The process starts, step 120, by logging onto the internet by the user at step 122. The user then enters a universal resource locator (URL) of the location server at step 124. The user receives a home page of the location server at step 126. The user enters a user identity information at step 128. An electronic address of the wireless transceiving device is entered at step 130. The location server sends an authorization query containing the electronic address of the wireless transceiving device and the user identify information to an authorization database for the wireless transceiving device at step 123. When the user is authorized to receive a location information, a location request is sent to the wireless communication network at step 134. An identify position message is broadcast over the wireless communication network at step 136. The position of the wireless transceiving device is determined at step 138. The position is transmitted to the wireless communication network at step 140. The position is forwarded to the location server at step 142. A street address based on the position is determined at step 144. The street address is transmitted to the user at step 146. The user's location is determined at step 148. A routed from the user location to the position is determined at step 150. A set of direction based on the route is prepared at step 152. At step 154, the set of direction is transmitted to the user which ends the process at step 156.

Using the above described system and method a user can easily locate a device. The location of the device is placed in a format that is easy for the user to understand and the user does not have to subscribe to a service to obtain this information.

The methods described herein can be implemented as computer-readable instructions stored on a computer-readable storage medium that when executed by a computer will perform the methods described herein.

While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alterations, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alterations, modifications, and variations in the appended claims.

Claims

What is claimed is:

1. A location system, comprising:

a location server connected to an internet designed to receive a location query from a user;

a wireless communication system connected to the location server and capable of transmitting the location query; and

a wireless transceiving device capable of receiving the location query and sending a location response.

2. The location system of claim 1, wherein the location server receives the location response and transmitting a map showing a position of the wireless transceiving device.

3. The location system of claim 1, wherein the location server is connected to a public switched telephone network and is capable of receiving the location query over the public switched telephone network.

4. The location system of claim 1, wherein the location server includes a speech synthesis module that transmits an audio description of a position of the wireless transceiving device.

5. The location system of claim 1, wherein the location server further includes a security system.

6. The location system of claim 5, wherein the server performs authentication, authorization and accounting functions.

7. The location system of claim 1, wherein the wireless transceiving device includes a global positioning system receiver.

8. The location system of claim 1, wherein the wireless transceiving device transmits a message containing a signal strength and a timing information from a plurality of base stations to the wireless communication system.

9. The location system of claim 8, wherein the wireless communication system determines a position based on the message containing the signal strength and the timing information from the plurality of base stations.

10. A method of operating a location system, comprising the steps of:

(a) receiving a location query at a location server over the internet from a user;

(b) transmitting a location request to a wireless communication network;

(c) broadcasting an identify position message over the wireless communication network;

(d) determining a position at a wireless transceiving device;

(e) transmitting the position to the wireless communication network; and

(f) forwarding the position to the location server.

11. The method of claim 10, further including the steps of:

(g) selecting an appropriate map based on the position at the location server;

(h) transmitting the appropriate map with a position marker to the user.

12. The method of claim 10, further including the steps of:

(g) determining a street address based on the position;

(h) transmitting the street address to the user.

13. The method of claim 12, further including the steps of:

(i) determining a user location;

(j) determining a route from the user location to the position.

14. The method of claim 13, further including the steps of:

(k) preparing a set of directions based on the route;

(l) transmitting the set of directions to the user.

15. The method of claim 10, wherein step (a) further includes the steps of:

(a1) logging onto the internet by the user;

(a2) entering a universal resource locator of the location server;

(a3) receiving a home page of the location server.

16. The method of claim 15, further including the steps of:

(a4) entering a user identity information;

(a5) entering an electronic address of the wireless transceiving device;

(a6) determining at the location server if the user is entitled to receive a location information for the wireless transceiving device.

17. The method of claim 15, wherein step (a6) further includes the steps of:

(i) sending an authorization query containing the electronic address of the wireless transceiving device and a user identity information to an authorization data base for the wireless transceiving device;

(ii) when the user is authorized to receive a location information proceeding to step(b);

(iii) when the user is not authorized to receive the location information, sending an authorization denied message to the location server.

18. The method of 16, wherein step (a5) further includes the step of:

(i) determining an appropriate wireless communication network based on the electronic address.

19. A location system comprising:

a location server connected to an internet and to a public switched telephone network, the location server capable of receiving a location query from a user over the internet or over the public switched telephone network, the location server having a map database and selecting an appropriate map based on a position, the location server transmitting the map to a user over the internet;

a security system connected to the location server, the security system determining an authorization, an authentication and an accounting information;

a plurality of wireless communication systems connected to the location server, one of the plurality of wireless communication systems receives a location request from the location server and transmits an identify position message; and

a wireless transceiving device capable of receiving the identify position message, the wireless transceiving device including a global positioning system receiver capable of determining a position, the wireless transceiving device transmitting the position to the one of the plurality of wireless communication systems.

20. The location system of claim 19, further including a speech synthesis module capable of converting a set of directions into audio signal.

21. A method of operating a location system comprising the steps of:

(a) logging onto the internet by the user;

(b) entering a universal resource locator of the location server;

(c) receiving a home page of the location server;

(d) entering a user identity information;

(e) entering an electronic address of the wireless transceiving device;

(f) sending an authorization query containing the electronic address of the wireless transceiving device and a user identity information to an authorization database for the wireless transceiving device;

(g) when the user is authorized to receive a location information, transmitting a location request to a wireless communication network;

(h) broadcasting an identify position message over the wireless communication network;

(i) determining a position at a wireless transceiving device;

(j) transmitting the position to the wireless communication network;

(k) forwarding the position to the location server;

(l) determining a street address based on the position;

(m) transmitting the street address to the user;

(n) determining a user location;

(o) determining a route from the user location to the position;

(p) preparing a set of directions based on the route; and

(q) transmitting the set of directions to the user.

22. The method of claim 21, further including the step of:

(r) when the user is not authorized to receive the location information, sending an authorization denied message to the location server.

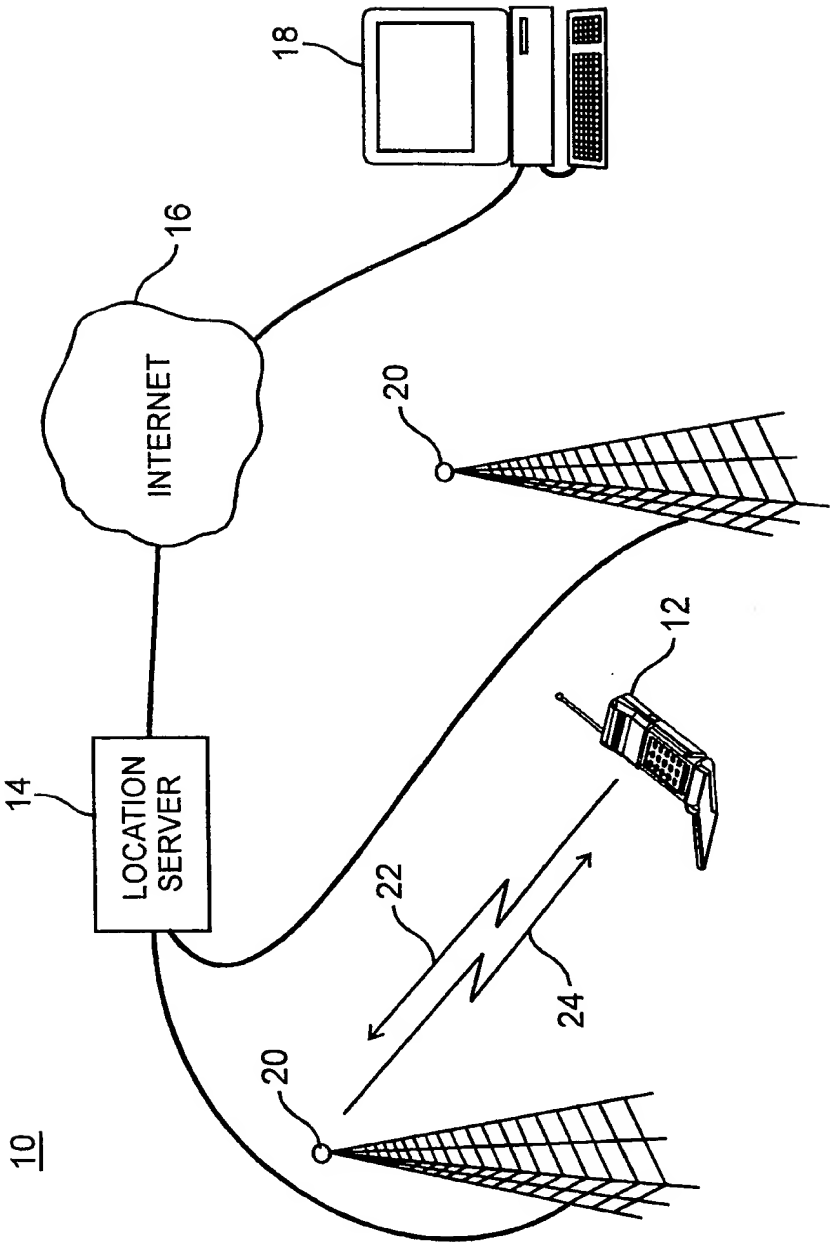


Fig. 1

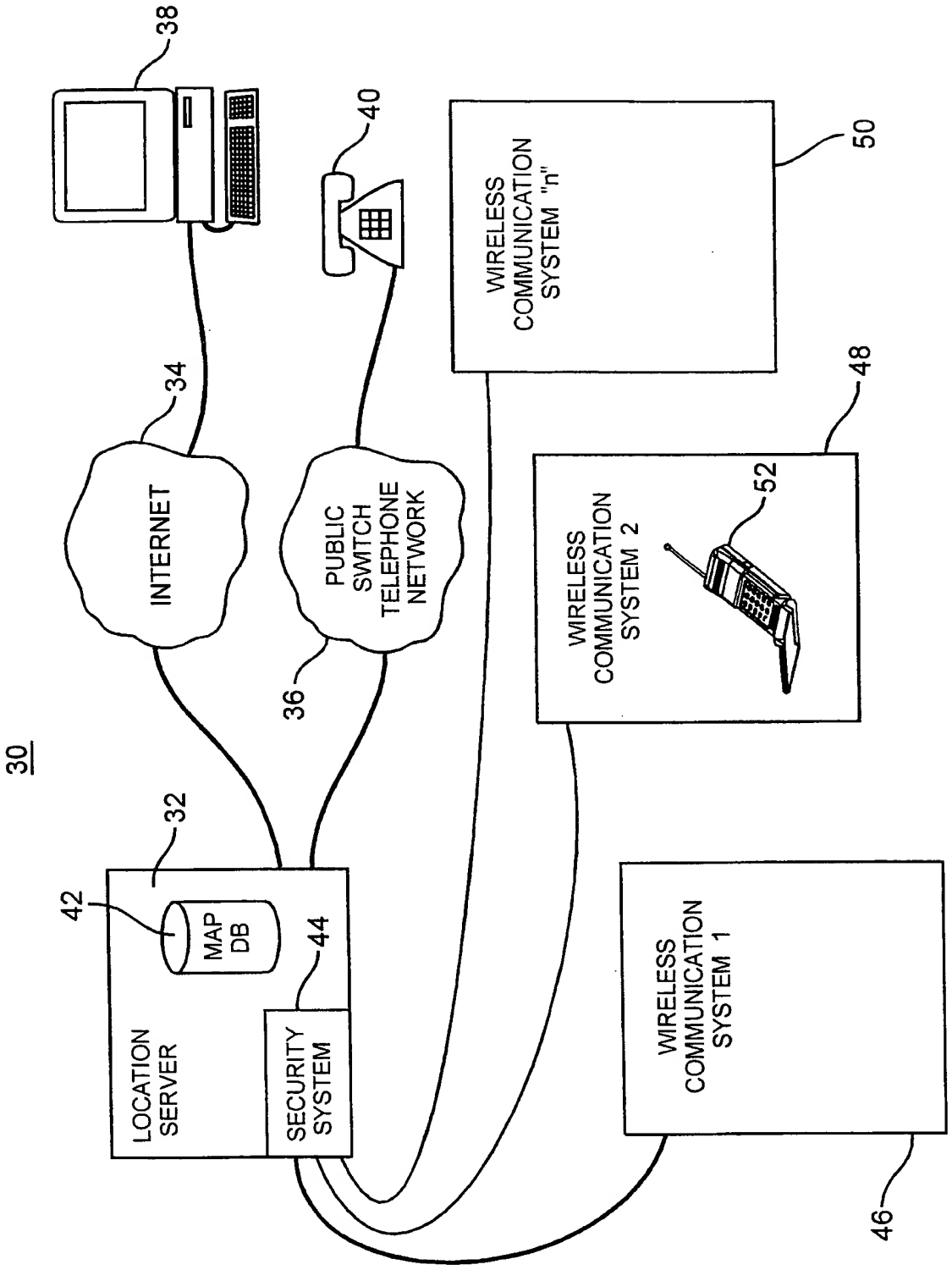

30
38
40
50
34
48
52
INTERNET
PUBLIC SWITCH TELEPHONE NETWORK
WIRELESS COMMUNICATION SYSTEM "n"
WIRELESS COMMUNICATION SYSTEM 2
36
32
42
MAP DB
44
LOCATION SERVER
SECURITY SYSTEM
WIRELESS COMMUNICATION SYSTEM 1
46

Fig. 2

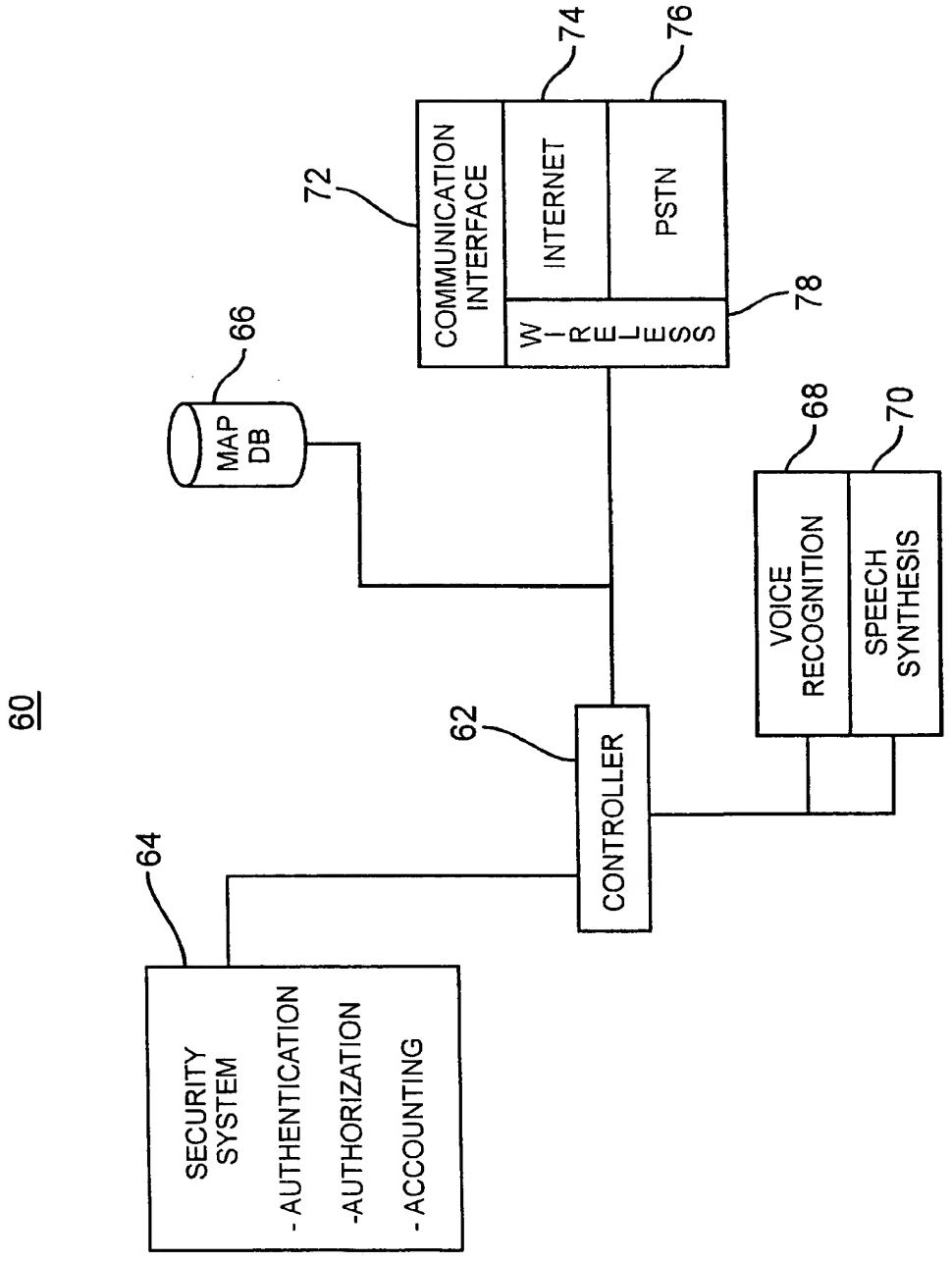

60
62
CONTROLLER
64
SECURITY SYSTEM
- AUTHENTICATION
-AUTHORIZATION
- ACCOUNTING
66
MAP DB
68
VOICE RECOGNITION
70
SPEECH SYNTHESIS
72
COMMUNICATION INTERFACE
74
INTERNET
76
PSTN
78
WIRELESS

Fig. 3

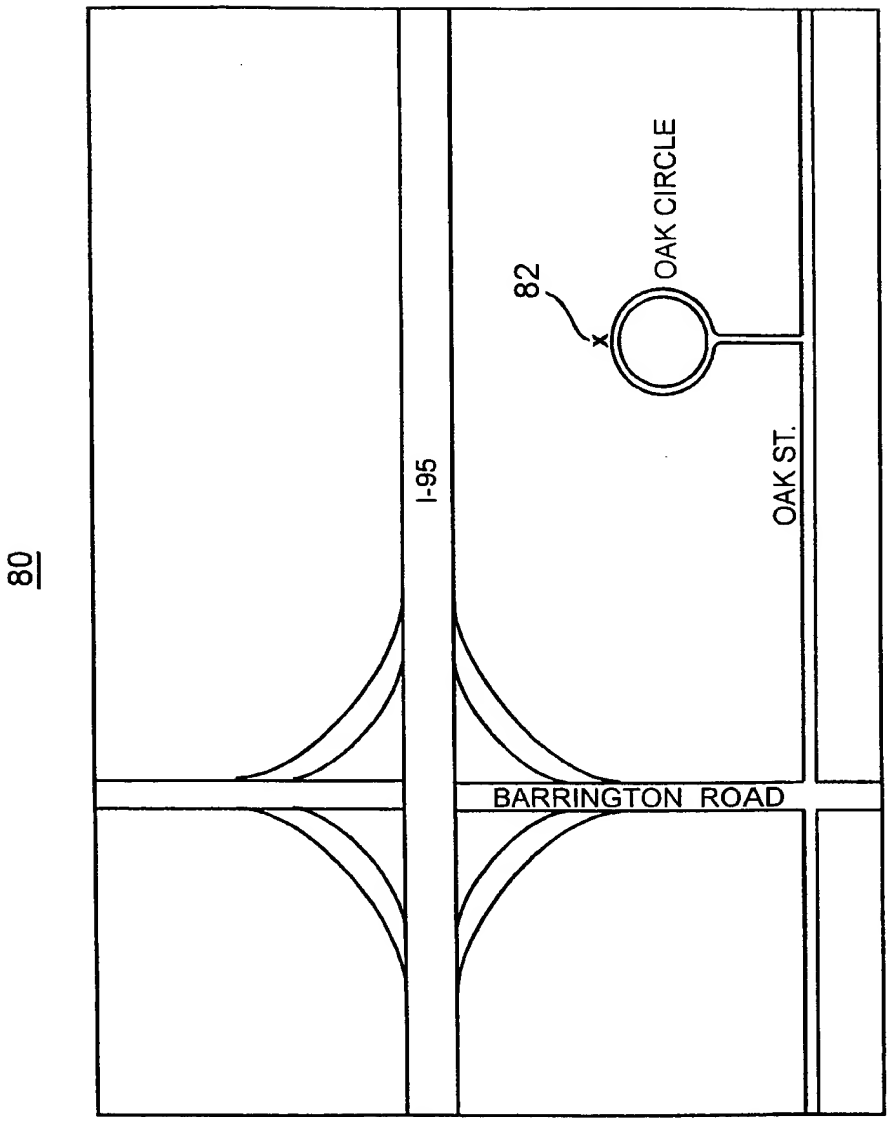


Fig. 4

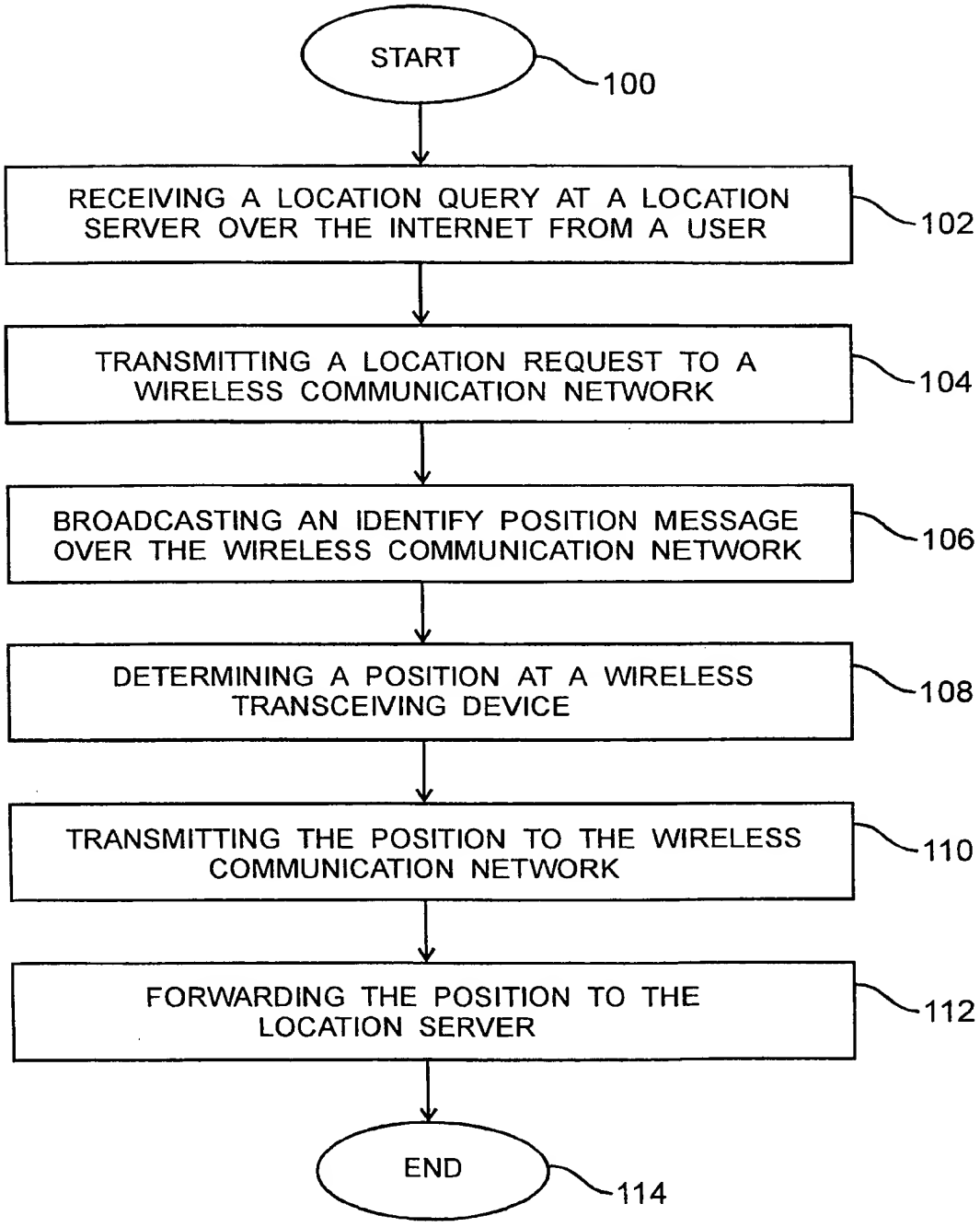

START
100
RECEIVING A LOCATION QUERY AT A LOCATION SERVER OVER THE INTERNET FROM A USER
102
TRANSMITTING A LOCATION REQUEST TO A WIRELESS COMMUNICATION NETWORK
104
BROADCASTING AN IDENTIFY POSITION MESSAGE OVER THE WIRELESS COMMUNICATION NETWORK
106
DETERMINING A POSITION AT A WIRELESS TRANSCEIVING DEVICE
108
TRANSMITTING THE POSITION TO THE WIRELESS COMMUNICATION NETWORK
110
FORWARDING THE POSITION TO THE LOCATION SERVER
112
END
114

Fig. 5

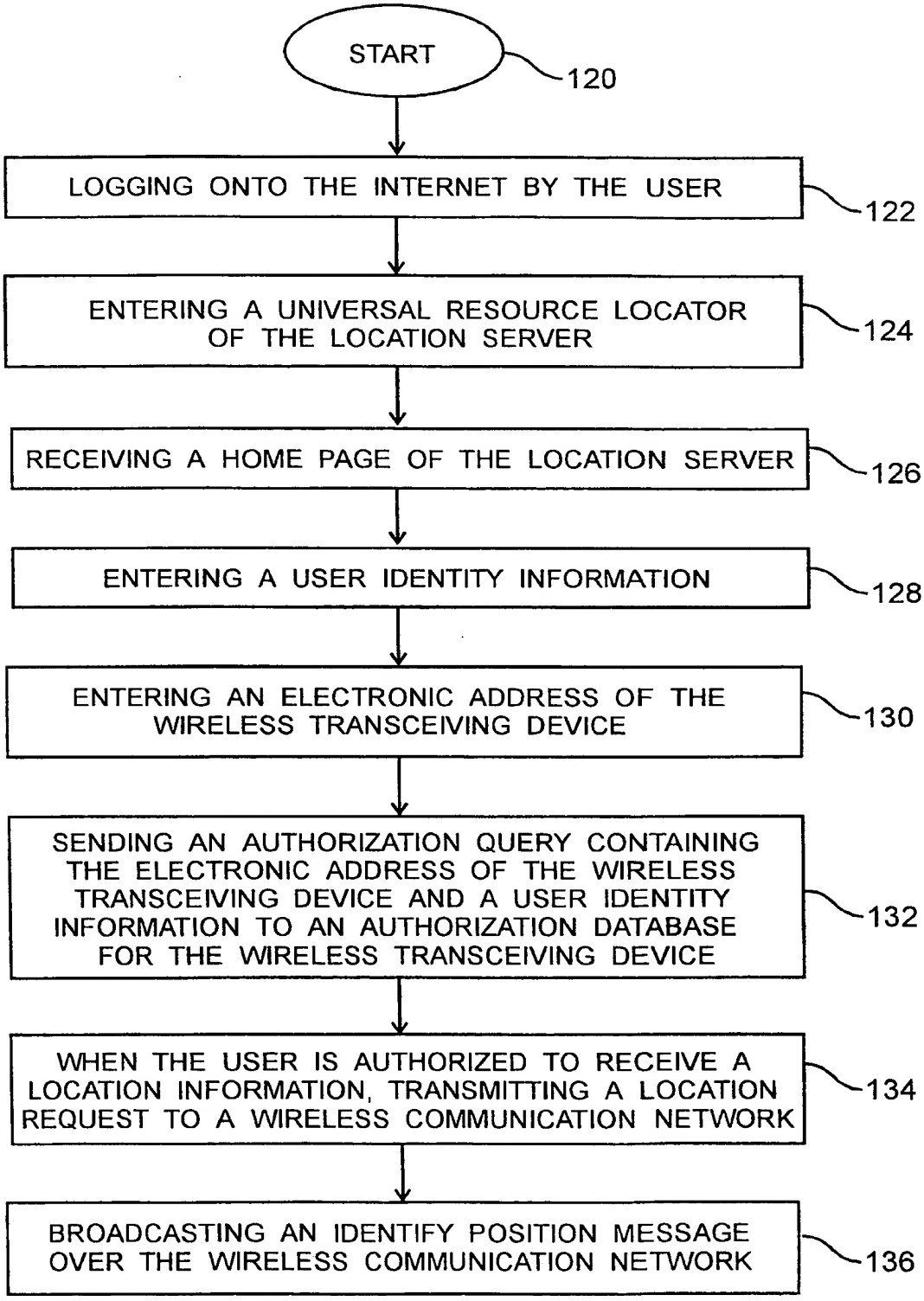
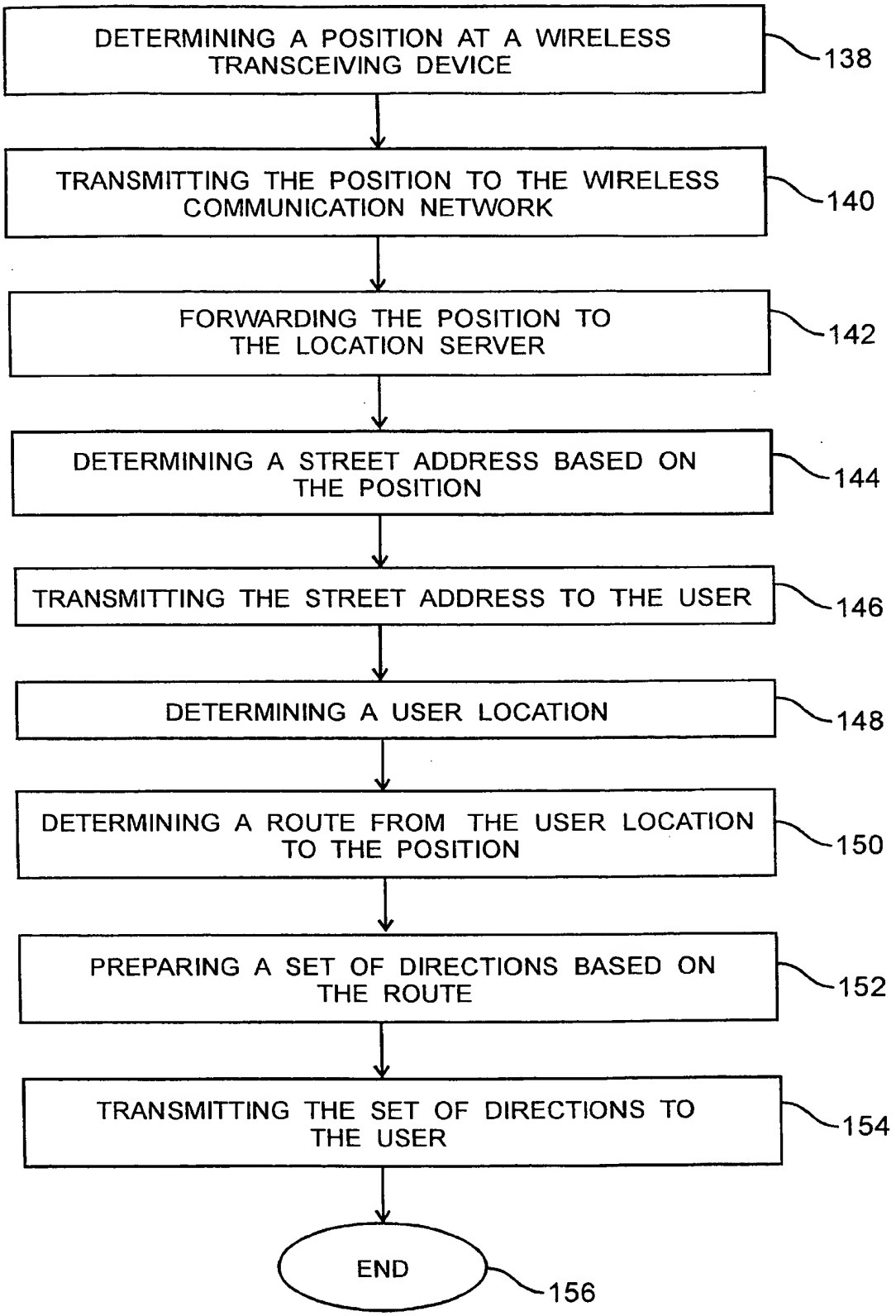

START
120
LOGGING ONTO THE INTERNET BY THE USER
122
ENTERING A UNIVERSAL RESOURCE LOCATOR OF THE LOCATION SERVER
124
RECEIVING A HOME PAGE OF THE LOCATION SERVER
126
ENTERING A USER IDENTITY INFORMATION
128
ENTERING AN ELECTRONIC ADDRESS OF THE WIRELESS TRANSCEIVING DEVICE
130
SENDING AN AUTHORIZATION QUERY CONTAINING THE ELECTRONIC ADDRESS OF THE WIRELESS TRANSCEIVING DEVICE AND A USER IDENTITY INFORMATION TO AN AUTHORIZATION DATABASE FOR THE WIRELESS TRANSCEIVING DEVICE
132
WHEN THE USER IS AUTHORIZED TO RECEIVE A LOCATION INFORMATION, TRANSMITTING A LOCATION REQUEST TO A WIRELESS COMMUNICATION NETWORK
134
BROADCASTING AN IDENTIFY POSITION MESSAGE OVER THE WIRELESS COMMUNICATION NETWORK
136

Fig. 6


DETERMINING A POSITION AT A WIRELESS TRANSCEIVING DEVICE
138
TRANSMITTING THE POSITION TO THE WIRELESS COMMUNICATION NETWORK
140
FORWARDING THE POSITION TO THE LOCATION SERVER
142
DETERMINING A STREET ADDRESS BASED ON THE POSITION
144
TRANSMITTING THE STREET ADDRESS TO THE USER
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DETERMINING A USER LOCATION
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DETERMINING A ROUTE FROM THE USER LOCATION TO THE POSITION
150
PREPARING A SET OF DIRECTIONS BASED ON THE ROUTE
152
TRANSMITTING THE SET OF DIRECTIONS TO THE USER
154
END
156

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/19328

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :H04B 7/00
US CL :455/12.1, 457
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 455/12.1, 13.1, 422, 427, 428, 456, 457

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,235,633 A (DENNISON ET AL) 10 AUGUST 1993, see figures 5-11, see column 5 line 19 to column 6, line 60.	1-14 and 19-20
Y	US 5,548,822 A (YPGO) 20 AUGUST 1996, see figures 1-3, see column 4, lines 9-25.	1-14 and 19-20

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 20 DECEMBER 1999	Date of mailing of the international search report 09 FEB 2000
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